Physics
GRADE 9

SLOs for Assessment Key:
1.Assessible / Attainable - (Not included in drop down list) cell will be blank and empty **2. Ambiguous (assessable in longer run) - (BOLD White)**
3. Not assessable in Summitive - (Grey)

Key:
Green color indicates a mistake in the naming of the Student Learning

Domains	Standards	Benchmarks	Topic/Title	NC SLO #	NCP (2022) - SLO	Status of SLOs	SLOs for	Cognitive Domain
Domain A: Measurement	Standard: Students will be able to: - express and mathematically manipulate basic and derived physical quantities - identify and explain the reasons for common sources of human and systematic error in experiments - identify, explain and describe the utility of measuring instruments in terms of precision - quantify the uncertainty	Benchmark |: Describe that physical quantities can be classified into basic and derived quantities. Physical quantities can be measured, but empirical measurements are accompanied by sources of error.	**Physical Quantities**	SLO: P-09-A-01	Differentiate Between physical and non-physical quantities	Modified(rephrased) SLO		Analyse
				SLO: P-09-A-02	Explain with examples that physics is based on physical quantities	Matched SLO		Understand
				SLO: P-09-A-03	Differentiate between base and derived physical quantities and units.	Modified (Split) SLO		Analyse
				SLO: P-09-A-04	Apply the seven units of System International (SI)	Modified (Split) SLO		Understand
				SLO: P-09-A-05	Analyse and express numerical data using scientific notation	Modified(rephrased) SLO		Understand
				SLO: P-09-A-06	Analyse and express numerical data , using prefixes	Matched SLO		Understand
				SLO: P-09-A-07	Differentiate between scalar and vector quantities	Modified(rephrased) SLO		Understand
				SLO: P-09-A-08	Justify that distance, speed, time, mass, energy, and temperature are scalar quantities.	Modified(rephrased) SLO		Understand
				SLO: P-09-A-09	Justify that displacement, force, weight, velocity, acceleration, momentum, electric field strength and gravitational field strength are vector quantities.	Modified(rephrased) SLO		Understand

Don	- quantify the uncertainty in readings taken and calculations made through those raw readings			SLO: P-09-A-10	Determine, by calculation or , graphically, the resultant of two vectors at right angles	Modified(rephrased) SLO		Apply
				SLO: P-09-A-11	Make reasonable estimates of physical quantities	Modified(rephrased) SLO		Understand
			Theory of Measurement:	SLO: P-09-A-12	Justify and illustrate the use of common lab instruments to measure length	Modified(rephrased) SLO		Understand
				SLO: P-09-A-13	Justify and illustrate the use of measuring cylinders to measure volume	Modified(rephrased) SLO		Understand
				SLO: P-09-A-14	Justify and illustrate how to measure time intervals using lab instruments	Modified(rephrased) SLO		Understand
				SLO: P-09-A-15	Determine an average value for an empirical reading	Modified(rephrased) SLO		Understand
				SLO: P-09-A-16	Round off and justify calculational estimates	Modified(rephrased) SLO		Understand
				SLO: P-09-A-17	Critique and analyze experiments for sources of error	Modified(rephrased) SLO	**Not assessable in summative**	Analyse
				SLO: P-09-A-18	Differentiate between precision and accuracy	Modified(rephrased) SLO		Understand
				SLO: P-09-A-19	Determine the least count of a data collection instrument (analog) from its scale	Modified(rephrased) SLO		Understand
				SLO: P-09-B-01	Differentiate between different types of motion	Modified(rephrased) SLO		Understand
				SLO: P-09-B-02	Differentiate between distance and displacement, speed and velocity.	Matched SLO		Understand
				SLO: P-09-B-03	Define and Calculate Speed	Modified(rephrased) SLO		Understand
				[SLO: P-09-B-04]	Define and Calculate average speed	Modified(rephrased) SLO		Understand
				[SLO: P-09-B-05]	Diffrentiate between average and instantaneous speed	Modified(rephrased) SLO		Understand

			Kinematics	[SLO: P-09-B-06]	Differentiate between uniform velocity and non-uniform velocity	Modified(rephrased) SLO		Understand
				[SLO: P-09-B-07]	Define and calculate acceleration	Modified(rephrased) SLO		Understand
				[SLO: P-09-B-08]	Differentiate between uniform acceleration and non uniform acceleration.	Modified(rephrased) SLO		Understand
				[SLO: P-09-B-09]	Sketch, plot and interpret distance— time and speed-time graphs. This includes determining from the shape of a distance-time graph when an object is: [(a) at rest, (b) moving with constant speed, (c) accelerating, (d) deccelerating, Students are Also required to know how to calculate speed from gradient of a distance-time graph it also includes determining from the shape of a speed time graph when an object is(a) at rest (b) moving with constant speed (c) moving with constant acceleration (d) moving with changing acceleration.]	Matched SLO		Understand
				[SLO: P-09-B-10]	Use the approximate value 9.8 9.8m/s? for free fall acceleration near Earth to solve problems	Matched SLO		Apply
				[SLO: P-09-B-11]	Justify how the gradient of a distance vs time graph gives the speed [Without using calculus]	Modified(rephrased) SLO		Apply
				[SLO: P-09-B-12]	Analyze the Distance traveling in speed vs time graphs [by determining the area under the graph for cases of motion with constant speed of constant acceleration]	Modified(rephrased) SLO		Apply
				[SLO: P-09-B-13]	Derive how the area beneath a speed vs time graph gives the distance traveled (without calculus)	Modified(rephrased) SLO		Apply
				[SLO: P-09-B-14]	Calculate acceleration from the gradient of a speed—time graph	Modified(rephrased) SLO		Apply

				[SLO: P-09-B-15]	Justify how the gradient of the speed vs time graph gives the acceleration [Without using calculus]	Modified(rephrased) SLO		Apply
			Relativity:	[SLO: P-09-B-16]	State that there is a universal speed limit for any object in the universe that is approximately 3 x 10^8m/s [Students should just be aware that this phenomenon is true; they do not need to study relativity in any depth. The purpose is that students appreciate that there is a universal speed limit.]	Modified(rephrased) SLO		Apply
			Dynamics: **Mass, Weight and Gravity**	[SLO: P-09-B-17]	Illustrate that mass is a measure of the quantity of matter in an object	Modified(rephrased) SLO		Remember
				[SLO: P-09-B-18]	Explain that the mass of an object resists change from its state of rest or motion (inertia)	Modified(rephrased) SLO		Understand
				[SLO: P-09-B-19]	Define and calculate weight	Modified(rephrased) SLO		Apply
				[SLO: P-09-B-20]	Define and calculate gravitational field strength	Modified (Split) SLO		Understand

				[SLO: P-09-B-21]	Justify and illustrate the use electronic balances to measure mass	Modified(rephrased) SLO	**Not assessable in summative**	Apply
				[SLO: P-09-B-22]	Justify and illustrate the use of a force meter to measure weight	Modified(rephrased) SLO	**Not assessable in summative**	Apply
				[SLO: P-09-B-23]	Differentiate between contact and noncontact forces	Modified(rephrased) SLO		Understand
				[SLO: P-09-B-24]	Differentiate between different types of forces	Modified(rephrased) SLO		Understand
				[SLO: P-09-B-25]	State that there are three fundamental forces and describe them in terms of their relative strengths	Modified(rephrased) SLO		Remember
				[SLO: P-09-B-26]	Represent the forces acting on a body using free body diagrams	Modified(rephrased) SLO	**Not assessable in summative**	Analyse
				[SLO: P-09-B-27]	State and apply Newton''s first law	Modified (Split) SLO		Remember

Domain B: Mechanics	Standard: Students will be able to: - Differentiate between and mathematically manipulate scalar and vector quantities - Describe and analytically and graphically analyze distance, displacement, speed, velocity, and acceleration - Differentiate between different kinds of forces and their effects - Use Newton's laws to analyze motion and equilibrium - Analyze circular and rotational motion in terms of forces and momentum - differentiate	Benchmark I: Describe and analyze translatory motion in one dimension through analytical and graphical manipulation of scalar and vector quantities . Benchmark II: Describe and analyze the effects of forces and momentum on the translational and rotational motion of bodies in one dimension Benchmark lll: Describe and analyze the dynamics of rotational motion quantitatively and circular motion qualitatively in terms of forces in one dimension. Benchmark VI:	**Forces: Types of Forces and Newtons's Laws**	[SLO: P-09-B-28]	Identify the effect of force on velocity	Modified(rephrased) SLO		Remember
				[SLO: P-09-B-29]	Determine the resultant of two or more forces acting along the same straight line	Modified(rephrased) SLO		Analyse
				[SLO: P-09-B-30]	State and apply Newton's second law in terms of acceleration	Modified (Split) SLO		Apply
				[SLO: P-09-B-31]	State and apply Newton’s third law	Modified (Split) SLO		Apply
				[SLO: P-09-B-32]	Explain with examples how Newton’s third law describes pairs of forces of the same type acting on different objects	Modified(rephrased) SLO		Understand
				[SLO: P-09-B-33]	State the limitations of Newton’s laws of motion.	Modified(rephrased) SLO		Understand
				[SLO: P-09-B-34]	Describe and identify states of equilibrium	Modified(rephrased) SLO		Understand
			Friction:	[SLO: P-09-B-35]	Analyse the dissipative effect of friction	Modified(rephrased) SLO		Analyse
				[SLO: P-09-B-36]	Analyse the dynamics of an object reaching terminal velocity	Modified(rephrased) SLO		Analyse
				[SLO: P-09-B-37]	Differentiate qualitatively between rolling and sliding friction	Modified(rephrased) SLO		Understand

Dom	between work, energy and power - use the law of conservation of energy to analyze the viability and efficiency of systems - differentiate between and mathematically analyze kinetic and gravitational potential energy	Describe and analyze in one dimension, analytically and graphically, how forces can cause solids to stretch and compress Benchmark V: Describe and analyze the effects of energy transfer and energy transformations on a body, along with the advantages and disadvantages of harnessing energy from natural resources		[SLO: P-09-B-38]	Justify methods to reduce friction.	Matched SLO		Analyse
			Momentum	[SLO: P-09-B-39]	Define and calculate momentum	Matched SLO		Apply
				[SLO: P-09-B-40]	Define and calculate impulse	Modified(rephrased) SLO		Apply
				[SLO: P-09-B-41]	Apply the principle of the conservation of momentum to solve simple problems in one dimension	Modified(rephrased) SLO		Apply
				[SLO: P-09-B-42]	Define resultant forcein terms of momentum	Modified(rephrased) SLO		Understand
			Turrning Effects:	SLO: P-09-B-43	Differentiate between like and unlike Parallel forces.	Modified(rephrased) SLO		Understand
				SLO: P-09-B-44	Analyze problems involving turning effects of forces	Modified(rephrased) SLO		Analyse
				SLO: P-09-B-45	Analyse objects in equilibrium using the principle of moments	Modified(rephrased) SLO		Analyse
				SLO: P-09-B-46	Justify experiment to verify the principle of moments	Modified(rephrased) SLO	**Not assessable in summative**	Analyse
				SLO: P-09-B-47	State what is meant by center of mass and center of gravity	Matched SLO		Remember
				SLO: P-09-B-48	Describe how to determine the position of the center of gravity of a lane lamina using a plumb line	Modified(rephrased) SLO		Understand
				SLO: P-09-B-49	Analyse, qualitatively, the effect of the position of the center of gravity on the stablity of simple objects	Modified(rephrased) SLO		Analyse
				SLO: P-09-B-50	Propose how the stability of an object an be improved	Modified(rephrased) SLO		Evaluate
				SLO: P-09-B-51	Illustrate the applications of stability physics in real life	Modified(rephrased) SLO		Apply

				SLO: P-09-B-52	Predict qualitatively the motion of rotating bodies	Modified(rephrased) SLO		Understand
			Centripetal Force	SLO: P-09-B-53	Describe qualitatively motion in a circular path due to a centripetal force,	Modified(rephrased) SLO		Understand
				SLO: P-09-B-54	identify the sources of centripetal force real life examples	Modified(rephrased) SLO		Analyse
			Deformation of Solids:	SLO: P-09-B-55	Illustrate that forces may produce a change in size and shape of an object	Modified(rephrased) SLO		Apply
				SLO: P-09-B-56	Define and calculate the spring constant	Modified(rephrased) SLO		Apply
				SLO: P-09-B-57	Sketch, plot and interpret load— xtension graphs for an elastic solid and describe the associated experimental procedures.	Modified(rephrased) SLO	**Not assessable in summative**	Analyse
				SLO: P-09-B-58	Define and use the term 'limit of proportionality' for a load—extension graph	Modified(rephrased) SLO		Understand
				SLO: P-09-B-59	Illustrate the applications of Hooke's Law	Modified(rephrased) SLO		Apply
				SLO: P-09-B-60	Define work done.	Matched SLO		Remember
				SLO: P-09-B-61	Use the equation work done = force x distance moved in the direction of the force W = F x d to solve problems	Matched SLO		Apply
				SLO: P-09-B-62	Define energy as the ability to do work	Modified(rephrased) SLO		Remember
				SLO: P-09-B-63	Explain that energy may be stored	Modified(rephrased) SLO		Remember
				SLO: P-09-B-64	Prove that Kinetic Energy Ek = 1/2 mv^2 [use of equations of motion not `needed; proof through kinematic graphs will suffice]	Modified(rephrased) SLO		Apply
				SLO: P-09-B-65	Prove and use the formula for Gravitational potential energy	Modified (Split) SLO		Apply

				SLO: P-09-B-66	Use the formulas for kinetic and Gravitational potential energy to solve problems involving simple energy conversions	Modified (Split) SLO		Apply
				SLO: P-09-B-67	Describe how energy is transferred and stored during events and processes	Modified(rephrased) SLO		Understand
				SLO: P-09-B-68	State and apply the principle of the conservation of energy	Modified(rephrased) SLO		Apply
				SLO: P-09-B-69	Justify why perpetual energy machines do not work	Modified(rephrased) SLO		Understand
				SLO: P-09-B-70	Differentiate between and list renewable and non-renewable energy sources	Modified(rephrased) SLO		Understand
				SLO: P-09-B-71	obtained from natural resources [including the cases of (chemical energy stored in fossil fuels, chemical energy stored in biofuels, hydroelectric resources, solar radiation, nuclear fuel, geothermal resources,solar radiation, wind, tides, waves in the seas.	Modified(rephrased) SLO		Apply
				SLO: P-09-B-72	Describe advantages and disadvantages of methods of energy generation	Modified(rephrased) SLO		Understand

				SLO: P-09-B-73	Define and calculate power	Matched SLO		Apply
				SLO: P-09-B-74	Define and calculate efficiency	Matched SLO		Apply
				SLO: P-09-B-75	Apply the concept of efficiency to simple problems involving energy transfer	Modified(rephrased) SLO		Apply
				SLO: P-09-B-76	State that a system cannot have an efficiency of 100% due to unavoidable energy losses that occur	Matched SLO		Remember
				SLO: P-09-B-77	.Define and calculate pressure	Matched SLO		Apply
				SLO: P-09-B-78	Describe how pressure varies with rce and area in the context of everyday examples	Matched SLO		Understand
				SLO: P-09-B-79	Analyse in situations how pressure at surface produces a force in a direction at right angles to the surface	Modified(rephrased) SLO		Analyse
				SLO: P-09-B-80	Justify that the atmosphere exerts a pressure.	Modified(rephrased) SLO		Understand
				SLO: P-09-B-81	describe that atmospheric pressure decreases with the increase in height above the Earth's surface.	Matched SLO		Understand
				SLO: P-09-B-82	explain that changes in atmospheric pressure in a region may indicate a , change in the weather.	Matched SLO		Understand
				SLO: P-09-B-83	Analyse the workings and applications of a liquid barometer	Modified(rephrased) SLO		Analyse
				SLO: P-09-B-84	Justify why and analyse quantitatively Pressure varies with depth in a liquid.	Modified(rephrased) SLO		Analyse
				SLO: P-09-B-85	Analyse the workings and applications of a manometer	Modified(rephrased) SLO		Analyse

				SLO: P-09-B-86	Define and apply Pascal's law	Matched SLO		Apply
Domain C: Heat and Thermodynamics	Standard: Students should be able to describe and analyze: - the effects of heat on the physical properties of matter by making reference to the kinetic theory of matter - how heat can be transferred through different modes	Benchmark I: Use the kinetic theory of matter to explain the physical properties of matter and how these transform upon changes in state	**Density:**	[SLO: P-09-C-01]	Define and calculate density	Matched SLO		Apply
				[SLO: P-09-C-02]	Justify and illustrate how to determine the density of a substance	Modified(rephrased) SLO		Analyse
			Particle Theory of Matter:	[SLO: P-09-C-03]	Describe, qualitatively, the particle structure of solids, liquids and gasses.	Modified(rephrased) SLO		Understand
				[SLO: P-09-C-04]	Describe plasma as a fourth state of matter	Matched SLO		Understand
			Temperature:	[SLO: P-09-C-05]	Describe the relationship between the motion of particles and temperature	Modified(rephrased) SLO		Understand
				[SLO: P-09-C-06]	State that an increase in the temperature of an object increases its internal energy	Modified(rephrased) SLO		Remember
				[SLO: P-09-C-07]	Explain, with examples, how a physical property which varies with temperature may be used for the measurement of temperature	Modified(rephrased) SLO		Understand
				[SLO: P-09-C-08]	Justify the need for fixed points in the calibration of thermometers	Modified(rephrased) SLO		Understand
				[SLO: P-09-C-09]	illustrate what is meant by the sensitivity, range and linearity of thermometers.	Modified(rephrased) SLO		Understand
				[SLO: P-09-C-10]	Diffrentiate between the structure and function of liquid-in-glass and of thermocouple thermometers	Modified(rephrased) SLO		Understand

				[SLO: P-09-C-11]	Analyze how the structure of a liquidin-glass thermometer affects its sensitivity, range and linearity	Modified(rephrased) SLO		Analyse
city and Magnetism	Standard: Students should be able to: - describe mathematically the nature of static magnetic and electric fields - analyze and account for the distribution of current, voltage and resistance in simple DC circuits. - explain how power can be generated through	Benchmark I :Explain qualitatively the origin, properties, phenomena and applications of static magnetic and electric fields in terms		[SLO: P-09-E-01]	Describe the forces between magnetic poles and between magnets and magnetic materials	New SLO		Understand
				[SLO: P-09-E-02]	Describe induced magnetism	New SLO		Remember
				[SLO: P-09-E-03]	State the difference between magnetic d non-magnetic materials	New SLO		Remember
				[SLO: P-09-E-04]	Differentiate Between Temporary and Permanent Magnets	New SLO		Understand
				[SLO: P-09-E-05]	Describe magnetic fields	New SLO		Understand
				[SLO: P-09-E-06]	Ilustrate the plotting of magnetic field lines with a compass or iron filings	New SLO	**Not assessable in summative**	Apply
				[SLO: P-09-E-07]	Draw the pattern and direction of the magnetic field lines around a bar magnet	New SLO	**Not assessable in summative**	Apply
				[SLO: P-09-E-08]	State that the direction of the magnetic field at a point is the direction of the force on the N pole of a magnet at that point	New SLO		Remember
				[SLO: P-09-E-09]	state that the relative strength of a magnetic field is represented by the spacing of the magnetic field lines	New SLO		Understand
				[SLO: P-09-E-10]	Describe uses of permanent magnets and electromagnets	New SLO		Apply
				[SLO: P-09-E-11]	Explain qualitatively in terms of the domain theory of magnetism how materials can be magnetized and demagnetized	New SLO		Understand

Domain E: Electri	be generated through electromagnetic induction - account for how motors make use of electromagnetism to generate kinetic energy. - analyse AC circuits in terms of current, resistance, reactance, voltage, and impedance .	electric fields in terms of magnetic domain theory and electric charges.		[SLO: P-09-E-12]	Differentiate between ferromagnetic, paramagnetic and diamagnetic materials	New SLO		Understand
				[SLO: P-09-E-13]	Describe the nature of the Earth's magnetic field	New SLO		Understand
				[SLO: P-09-E-14]	Analyze applications of magnets in recording technology	New SLO		Analyse
				[SLO: P-09-E-15]	State that soft magnetic materials such as soft iron) can be used to provide shielding from magnetic fields	New SLO		Remember
Domain F: Modern Physics	Standard: Students will be able to: - Describe the standard model of particle physics - Analyze radioactive decay processes - Explain the processes of nuclear fusion and fission - Explain the postulates and implications of special relativity - Use the quantum	Benchmark |: Describe and explain, with reference to broad qualitative ideas from relativity, quantum mechanics and particle physics: (1) the structure of atoms and atomic nuclei (2) the origin of radioactivity and its		[SLO: P-09-F-01]	Define and calculate average orbital speed	Modified(rephrased) SLO		Apply
				[SLO: P-09-F-02]	Interpret and compare given planetary	Modified(rephrased) SLO		Evaluate
				[SLO: P-09-G-01]	Describe physics as the study of matter, energy, space, time and their mutual connections and interactions	Modified(rephrased) SLO		Understand

Domain G: Nature of Science	Standard: Students should be able explain with examples that science operates in a historical context that affects its current practices and paradigms	Benchmark I: Critically analyze claims made about the relationship of physics with society.		[SLO: P-09-G-02]	Explain with examples that physics has many sub-fields, and in today's world involves interdisciplinary fields.	Modified(rephrased) SLO		Understand
				[SLO: P-09-G-03]	Explain with examples how Physics is a subset of the Physical Sciences and of the natural sciences	Modified(rephrased) SLO		Understand
				[SLO: P-09-G-04]	State that scientists who specialize in the research of physics are called Physicists	Modified(rephrased) SLO		Remember
				[SLO: P-09-G-05]	Brief with examples that science is a collaborative field that requires interdisciplinary researchers working together to share knowledge and crititique ideas	Modified(rephrased) SLO		Understand
				[SLO: P-09-G-06]	Understand the terms 'hypothesis', theory' and 'law' in the context of research in the physics	Matched SLO		Understand
				[SLO: P-09-G-07]	Explain, with examples in Physics, alsifiability as the idea that a theory is scientific only if it makes assertions that can be disproven	Modified(rephrased) SLO		Understand
				[SLO: P-09-G-08]	Differentiate the terms 'science', 'technology' and 'engineering' with suitable examples	Modified(rephrased) SLO		Analyse
				SLO: P-09-10-N-01	explain, with examples, how hazards in a science lab can be classified into: ((i) physical hazards, (ii) chemical hazards, (iii) biological hazards, (v) safety hazards)	New SLO		Understand
				SLO: P-09-10-N-02	Identify the meaning of common hazard signs in the laboratory	New SLO		Remember
				SLO: P-09-10-N-03	call emergency services in case of an accident in the lab	New SLO		Understand

	Students should be able to demonstrate knowledge of how to select and safely use techniques, apparatus and materials	Students should be able to follow provided safety instructions and take general precautions in a lab setting		SLO: P-09-10-N-04	- True value: the value that would be obtained in an ideal measurement - Measurement error: the difference between a measured value and the true value of a quantity - Accuracy: a measurement result is described as accurate if it is close to the true value - Precision: how close the measured values of a quantity are to each other - Repeatability: a measurement is repeatable if the same or similar result is obtained when the measurement is repeated under the same conditions, using the same method, within the same experiment - Reproducibility: a measurement is reproducible if the same or similar result is obtained when the measurement is made under either different conditions or by a different method or in a different experiment - Validity of experimental design: an experiment is valid if the experiment tests what it says it will test. The experiment must be a fair test where only the independent variable and dependent variable may change, and controlled variables are kept constant - Range: the maximum and minimum value of the independent or dependent variables	New SLO		Apply
	Students should be able to plan experiments and investigations	Create an outline of how to conduct an experiment to compare a given dependent variable and independent variable		SLO: P-09-10-N-05	identify appropriate apparatus for collecting the data	New SLO		Understand
				SLO: P-09-10-N-06	visualize how the collected data would be tabulated or graphed	New SLO		Understand
				SLO: P-09-10-N-07	explain step by step the methodology for analyzing the data (e.g. gradient of line of best fit, plugging average value of dependent variable into a formula etc.)	New SLO		Understand
				SLO: P-09-10-N-08	suggest how sources of human and systematic error could be mitigated	New SLO		Evaluate
				SLO: P-09-10-N-09	set up experimental apparatus under supervision from an instructor	New SLO	Not assesible in Summative	Create
				SLO: P-09-10-N-10	take steps to avoid parallax error	New SLO		Remember
				SLO: P-09-10-N-11	identify and correct for potential zero error	New SLO	Not assesible in Summative	Analyse

				SLO: P-09-10-N-12	take an appropriate number of readings to average out errors	New SLO		Apply
				SLO: P-09-10-N-13	take correct meniscus readings	New SLO		Apply
				SLO: P-09-10-N-14	record sources of potential error (e.g. lack of lighting due to power outage)	New SLO		Understand
				SLO: P-09-10-N-15	take steps to avoid systematic error in specific context of the experiment e.g. ensuring that the table the set-up in on is level	New SLO		Apply
				SLO: P-09-10-N-16	make measurements using common laboratory apparatus, such as millimetre scales, protractors, top-pan balances, newton meters, analogue or digital electrical meters, measuring cylinders, vernier calipers, micrometer screw gauges and thermometers	New SLO		Apply
				SLO: P-09-10-N-17	use a stop-watch to measure intervals of time, including the period of an oscillating system by timing an appropriate number of consecutive oscillations	New SLO		Apply
				SLO: P-09-10-N-18	use both analogue scales and digital displays. Be familiar with the following experimental contexts	New SLO		Apply
				SLO: P-09-10-N-19	measurement of physical quantities such as length, volume or force	New SLO		Apply
				SLO: P-09-10-N-20	measurement of small distances or short intervals of time	New SLO		Apply
		Collect data under instructor supervision while minimizing sources of random		SLO: P-09-10-N-21	determining a derived quantity such as the extension per unit load for a spring, the value of a known resistance or the acceleration of an object	New SLO		Apply

Domain H: Experimentation Skills		sources of random and systematic error		SLO: P-09-10-N-22	testing and identifying the relationship between two variables such as between the potential difference across a wire and its length	New SLO	Not assesible in Summative	Analyse
				SLO: P-09-10-N-23	comparing measured quantities such as angles of reflection	New SLO		Understand
	Students should be able to make and record observations, measurements and estimates			SLO: P-09-10-N-24	comparing derived quantities such as density	New SLO		Understand
				SLO: P-09-10-N-25	cooling and heating, including measurement of temperature	New SLO		Apply
				SLO: P-09-10-N-26	experiments using springs and balances	New SLO		Apply
				SLO: P-09-10-N-27	timing motion or oscillations	New SLO		Apply
				SLO: P-09-10-N-28	Comparing electric circuits, including the connection and reconnection of these circuits, and the measurement of current and potential difference	New SLO		Understand
				SLO: P-09-10-N-29	optics experiments using equipment such as optics pins, mirrors, prisms, lenses, glass or Perspex blocks (both rectangular and semi-circular), including the use of transparent, translucent and opaque substances to investigate the transmission of light	New SLO		Apply
				SLO: P-09-10-N-30	procedures using simple apparatus, in situations where the method may not be familiar to the candidate.	New SLO		Apply
				SLO: P-09-10-N-31	Record measured and calculated quantities with correct units accompanying them	New SLO		Apply
				SLO: P-09-10-N-32	Organise tabulated results with the following elements present: the heading of each column, the name or symbol of the measured or calculated quantity, together with the appropriate unit.	New SLO		Apply
				SLO: P-09-10-N-33	Label axes with quantities and units	New SLO		Apply

		abulate and graph data appropriately		SLO: P-09-10-N-34	Use scales for the axes that allow the majority of the graph paper to be used in both directions, and be based on sensible ratios, e.g. 2cm on the graph paper representing 1, 2 or 5 units of the variable (or 10, 20 or 50, etc.).	New SLO		Apply
				SLO: P-09-10-N-35	Plot data points to an accuracy of better than one half of one of the smallest squares on the grid.	New SLO		Apply
				SLO: P-09-10-N-36	Plot data points using small crosses or fine dots with a circles drawn around them.	New SLO		Apply
				SLO: P-09-10-N-37	Plot data points using small crosses or fine dots with a circles drawn around them.	New SLO	Not assesible in Summative	Analyse
				SLO: P-09-10-N-38	Use measuring instruments to their full precision	New SLO	Not assesible in Summative	Analyse
		Estimate data collected to an appropriate number of significant figures and decimal points		SLO: P-09-10-N-39	Estimate the number of significant figures for calculated quantities as being the same as the least number of significant figures in the raw data used.	New SLO		Apply
				SLO: P-09-10-N-40	Show clear working in calculations, and key steps in reasoning	New SLO		Apply
	Students should be able to interpret and evaluate experimental observations and data	Analyse plotted linear graphs and tables		SLO: P-09-10-N-41	Express calculated ratios as decimal numbers, of two or three significant figures.	New SLO		Apply
				SLO: P-09-10-N-42	Sketch lines of best fit with an equal number of points on either side of the line over its entire length (the points should not be seen to lie all above the line at one end, and all below the line at the other end)	New SLO	Not assesible in Summative	Apply
				SLO: P-09-10-N-43	Convey the calculations for the gradient of a straight line by using a triangle whose hypotenuse extends over at least half the length of the plotted graph line.	New SLO	Not assesible in Summative	Analyse
				SLO: P-09-10-N-44	Determine the intercept of a straight line graph	New SLO		Understand
				SLO: P-09-10-N-45	Take readings from graphs by extrapolation or interpolation	New SLO		Apply

				SLO: P-09-10-N-46	Identify whether an experimental procedure has validity (whether the results really do represent what they are supposed to measure) regarding the hypothesis being tested, and suggest changes to ensure validity as appropriate	New SLO	Not assesible in Summative	Analyse
	Students should be able to evaluate methods and suggest possible improvements	Evaluate and suggest improvements regarding whether an experimental design: - is valid and reliable - has sources of error that could be better mitigated - is safe to conduct		SLO: P-09-10-N-47	identify whether an experimental procedure is r	New SLO		Analyse
				SLO: P-09-10-N-48	recommend how to mitigate sources of random and systematic error inherent in the given experimental design	New SLO		Evaluate
				SLO: P-09-10-N-49	identify unsafe procedure in an experimental design and suggest ways to mitigate any hazards	New SLO	Not assesible in Summative	Analyse